

<u>Y</u>	<u>MILS (mm)</u>
B	79 (2.0 mm)
C	109 (2.7 mm)
D	138 (3.5 mm)
E	168 (4.3 mm)
F	188 (4.8 mm)
G	218 (5.5 mm)
H	249 (6.3 mm)
J	280 (7.1 mm)

613-BLANK

SECTION 614

PILING WALLS

614.1 - DESCRIPTION:

This work shall consist of furnishing and placing steel piles in predrilled holes, concrete or grout, backfill and lagging, of the kinds and dimensions designated, in accordance with these provisions and in reasonably close conformity with the lines, grades, dimensions, and locations shown on the Plans or established by the Engineer. Painting of the exposed steel is included.

Careful attention shall be given to assuring the pile wall will tie directly into an existing stable slope. Prior to ordering any materials, the contractor in conjunction with the Engineer shall conduct a project site review in order to verify the limits of the pile wall.

614.2 - MATERIALS:

Materials shall conform to the requirements specified in the following Subsections of Division 700:

<u>MATERIAL</u>	<u>SUBSECTION</u>
Steel Piles and Splices	709.12
Steel Lagging and Wales	709.12
Reinforcing Steel	709.1
Prestressing Steel	709.2
Treated Timber Lagging	710
Portland Cement	701.1
Fine Aggregate	702.1
Fly Ash	707.4

614.3 - DRILLING:

614.4

A drilled hole is required for the buried length of the pile.

A minimum of 1/3 the total pile length or 10 feet (3 m), whichever is greater, is to be placed in bedrock/shale. Deviation from this requirement will be controlled by a Plan note. The total estimated pile length and the depth to the estimated bedrock/shale line are shown on the piling profile. Should the elevation of the actual bedrock/shale vary from the estimated elevation by more than 2.5 feet (0.8 m), the Engineer must approve the hole prior to placement of the pile. The material from the drilled hole shall be removed and disposed of by the Contractor in an approved site.

Particular care must be taken in the drilling operation to avoid deflecting the bit along a sloping bedrock/shale line. To verify proper alignment, the Contractor shall measure and record the vertical alignment of the hole using a plumb bob or other acceptable method.

Preferably, the diameter of the drilled hole shall be a size that will allow the pile, while being slowly lowered into the hole, to reach the bottom of the hole under the impetus of the pile weight. The minimum hole diameter shall be 2 inches (50 mm) larger than the diagonal distance across the pile cross section.

Light tapping (ten blows with at least 3 inches (75 mm) of penetration per blow) with a pile hammer exerting no more than 12,000 ft/lbs (16 kJ) of energy is permitted at the direction of the Engineer to advance the pile past minor obstacles in the hole.

Temporary casing of holes may be needed to maintain an open clean hole through the soil overburden. There will be no additional compensation for temporary casing. The cost of any casing used shall be included in the unit price bid for piling.

614.4 - INSTALLATION OF PILES:

Piles shall be located as shown on the Plans or as directed by the Engineer. Piles shall be installed with the pile center within 1 inch (25 mm) of the Plan location. The piles must be prevented from rotating, so that the pile axis is within five degrees of the position shown on the Plans.

The maximum permissible vertical deviation for piles shall be one percent of the total pile length, as measured at the actual pile location.

It is desirable that piles be installed without splicing; however, at the direction of the Engineer splices may be made. Splice lengths at the top of the piles may be butt welded provided the splice lengths are less than the required splice plates. No payment will be made for cut-offs. Welding shall be in accordance with [615.3.16](#).

Accurate records shall be maintained by the Contractor showing the depth to which each pile was placed, the plumbness, the amount of material used, elevation of bedrock/shale, and any unusual conditions encountered during the pile installation. These records shall be incorporated into the permanent records of the project.

614.5 - CORROSION PROTECTION:

Piles will be protected from corrosion and sealed by the placement of

concrete or grout, from the bottom of the hole to the bottom of the lagging or as directed by the Engineer. Vibration of the concrete or grout is not required. The Contractor shall complete all concrete or grout operations for holes drilled during the work day.

The drilled hole shall be pumped free of water and shall be reasonably free of fall-in soil or other debris prior to the placement of the concrete or grout. The concrete or grout in the bedrock/shale portion of the hole will be pumped or tremied through a pipe beginning at the bottom of the drilled hole. The pipe shall be slowly raised ensuring the pipe end remains at least 2 feet (600 mm) below the surface of the concrete or grout. A means of positively measuring the elevation of the concrete or grout as it is placed shall be provided by the Contractor.

After placing the concrete or grout in the bedrock/shale, the Contractor has the option of either pumping or pouring directly into the hole the remainder of the concrete or grout. Placing the concrete or grout from the bottom of the hole to the bottom of the lagging shall be accomplished in one continuous operation.

The Contractor will inform the Engineer, at the preconstruction conference, as to the type of corrosion protection that will be used. Intermixing of concrete and grout will not be allowed, unless approved by the Engineer.

Concrete shall be in accordance with Section 601, Class B. The job site testing is waived

Grout will be furnished and placed in accordance with the requirements specified herein.

The acceptance sampling and testing of the grout is the responsibility of the Division.

Quality Control of the concrete or grout is the responsibility of the Contractor as designated in Materials Procedure MP 601.03.50. The Contractor shall maintain equipment and qualified personnel, who shall direct all field inspection, sampling, and testing necessary to determine the magnitude of the various properties of the concrete and grout governed by the Specifications and shall maintain these properties within the limits of this Specification. The Quality Control Plan designated in MP 601.03.50 shall be submitted to the Engineer at the pre construction conference. Work shall not begin until the Plan is reviewed for conformance with the contract documents.

The required 7-day compression strength of the grout shall be a minimum of 2,000 psi (14 MPa). Grout which does not attain the 2,000 psi (14 MPa) strength in 7 days but exceeds a strength of 1,600 psi (11 MPa) shall be subject to price reduction based on the percentage of strength attained.

A grout strength test shall consist of testing three 6 in x 12 in (150 mm x 300 mm) cylindrical specimens. The test results shall be the average of the three specimens. One set of three specimens shall be made for each day's operations.

The bid price for the piling with grout compressive strengths greater than or equal to 2,000 psi (14 MPa) will be paid at 100 percent unless the piling installation does not meet Specifications for other reasons. Between 1,600 psi

614.6

(11 MPa) and 2,000 psi (14 MPa) compressive strengths, the cost of the grout will be deducted from the actual grout cost on a proportional basis with 2,000 psi (14 MPa) being 100 percent and 1,600 psi (11 MPa) being zero percent payment. With 1,600 psi (11 MPa) grout, the piling installation would be considered to meet 80 percent of the Specifications and the penalty being zero payment for the grout.

The penalty would involve only the quantity of grout represented by the failing compressive strength results.

The bid price for the piling will be reduced for the piles grouted with grout having less than 1,600 psi (11 MPa) compressive strengths as follows:

A = Compressive strength of grout

B = Total foot (meter) of piling grouted with

C = Unit bid price per foot (meter) of piling

D = Cost of grout (from Contractor)

E = 2,000 psi (14 Mpa)

F = Total penalty

$$F = D + [BC - D] 10.80 - (A + E)]$$

614.6 - PAINTING:

All surfaces from the top of the steel pile, down to and including 2.0 ft. (600 mm) below the top of the anticipated grout line shall be cleaned and painted. The method of surface preparation shall be hand tool cleaning to SSPC-SP-2. The paint system shall consist of one-coat of aluminum epoxy mastic meeting the requirements of 711.12 applied at a minimum dry film thickness of 5 mils (125 μ m).

614.7 - LAGGING AND BACKFILLING:

Lagging of the type and size as specified on the Plans shall be installed between the piles. Backfilling and restoration of the roadway template shall be as shown on the Plans.

Timber lagging shall be Grade # 3 or better treated rough cut oak, 3 in (75 mm) wide by 8 in (200 mm) deep for heights up to 11 ft (3.4 m); and for wall heights exceeding 11 ft (3.4 m) the timber lagging shall be double 3 in (75 mm) wide by 8 in (200 mm) deep. The boards shall be cut to their required length prior to preservative treatment.

The timber lagging shall conform to Sections 710.3 and 710.4 of the West Virginia Division of Highways Standard Specifications and shall be CCA treated for soil and fresh water use, as per AWWA C2.

614.8 - METHOD OF MEASUREMENT:

The quantity of piles will be measured in linear feet (meters) of piles installed and accepted for the wall. The quantity of lagging will be measured in square feet (meters) of lagging installed and accepted for the wall.

614.9-BASIS OF PAYMENT:

The quantities will be paid for at the contract unit prices bid for the items listed below, which prices and payments shall be full compensation for furnishing all materials and doing all the work herein prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work. The cost of drilling, concrete, grout, wales, and painting shall be included in the price bid for the piles. The cost of painting and welding steel lagging shall be included in the price bid for steel lagging.

614.10-PAY ITEMS:

ITEM	DESCRIPTION	UNIT
614001-*	"size" STEEL PILE	LINEAR FOOT (METER)
614002-*	STEEL LAGGING, THICKNESS "thickness"	SQUARE FOOT (METER)
614003-*	CONCRETE LAGGING, THICKNESS "thickness"	SQUARE FOOT (METER)
614004-*	TIMBER LAGGING	SQUARE FOOT (METER)

* Sequence number